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No. 16

SCIENTISTS FIND A NEW PLOY FOR DUTCH ELM DISEASE CONTROL

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FORESTRY SCIENCE PHOTO STORY

Cherchez La Femme, ZAP!!!!

Mating may soon become a dangerous game -- at least for the male Scolytus multistriatus beetle. In the olden days, all he had to do was follow the French maxim, "Cherchez la femme," seek out female beetles, and mate with them. Now a group of scientists have plans to confuse the process. They plan to enlist the beetle's natural sex drive in an attempt to reduce the number of beetles.

Better known as the smaller European elm bark beetle, Scolytus multistriatus is a carrier of the fungus disease causing Dutch elm disease. The disease, which has already taken an enormous toll among valuable American elm shade trees, continues to threaten elms from Coast to Coast.

The scientists investigating the sex attractant include Forest Service entomologists John W. Peacock and A. Charles Lincoln of the Insect & Disease Research Laboratory at Delaware, Ohio, and chemist Robert M. Silverstein and entomologist John B. Simeone, from the State University College of Forestry at Syracuse, New York.

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These scientists have discovered that the male elm bark beetle's sex drive is triggered by a powerful attractant produced by virgin female elm bark beetles. Once they have isolated, identified, and synthesized this sex attractant, which in scientific language is called a pheromone, the scientists say they could conceivably use it in several ways to decrease the number of insects spreading the disease. It might be used to lure unsuspecting male insects to traps where they will be killed. Or the attractant might be employed to lure beetles to traps where they will be sterilized by means of chemical sterilants. Sterilized beetles could still fly to and mate with other beetles, but eggs resulting from the matings are infertile. Finally, the scientists feel the substance might be dispersed in a given area to confuse males seeking a mate and, subsequently, thwart mating.

If the use of the attractant proves successful, it will have one major advantage over existing methods -- it will be a safe, non-polluting control measure that should have no effect on living organisms in the environment other than elm bark beetles.

Prior to the recent studies on the pheromone, scientists had reported evidence of an attractant produced by decaying elm trees. It now appears that the pheromone, produced by the virgin females as they tunnel through the elm to carve themselves suitable breeding sites, is an even more powerful attractant. Through field studies in Syracuse, the scientists were able to establish that the pheromone attractant is unique to virgin female beetles. Neither tunneling male beetles, nor mated male and female beetles produce the attractant.

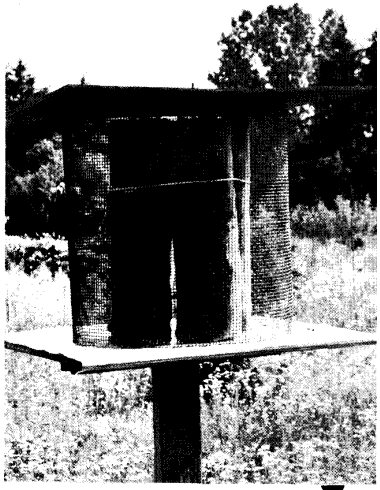
Scientists used a number of traps in the study. Into the traps went laboratory reared beetles placed on short elm logs enclosed in screen bags. Four combinations of beetles and elm logs were used -- either elm logs alone, or logs with unmated females, logs with unmated males, or logs with both males and females. Screen bags were wrapped around each log to prevent beetles from leaving the logs and also to prevent their mating with beetles attracted to the traps from outside.

The logs were placed upright in the traps and surrounded with a hardware cloth cylinder. Each cylinder was coated with a sticky material, so that any wild, flying beetles, attracted to the logs or beetles inside the trap, would be caught.

Each day, beetles trapped were removed, counted, and classified according to sex. At the end of the study, the number of beetles attracted to each type of trap was tallied according to sex. Scientists found traps containing logs with virgin females five to ten times more attractive than any other treatment tested. In fact, one trap containing the combination of elm log and virgin females, attracted more than 1500 beetles in less than 2 hours of testing time.

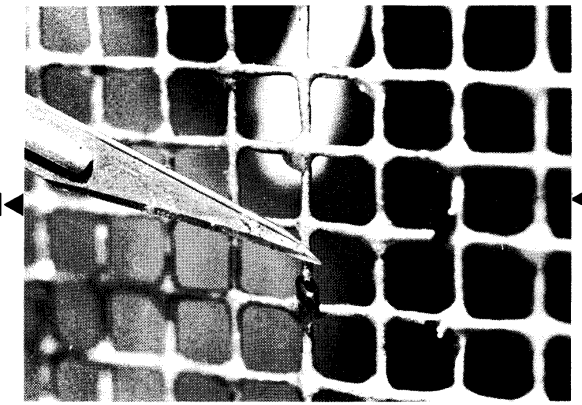
Elm bolts 3-5 inches in diameter and 18 inches long were enclosed in 32-mesh plastic screen. The ends had been waxed, and the wood was air-dried for 3 days before being used in the study.

From 10 to 200 adult insects were introduced into each screen-enclosed log. The screen served 2 purposes: it confined the beetles to the wood, and; it prevented wild beetles from entering. The long-stemmed, glass funnel was withdrawn after the beetles were put in, and the ends of screen were stapled to the wood.

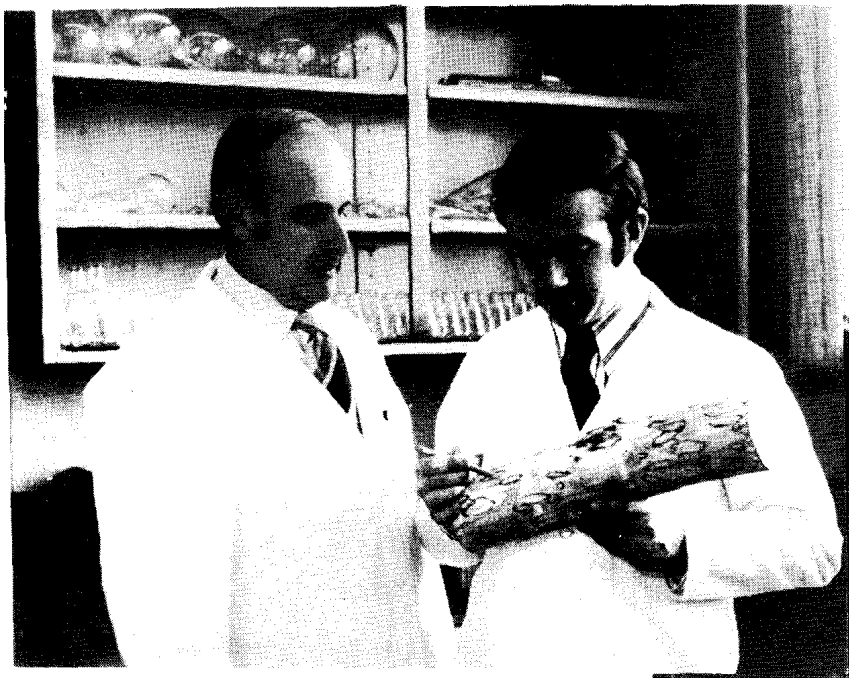


A sticky-coated hardware cloth cylinder surrounds 4 elm bolts in this trap. The trap was about 5 feet above the ground

These glass vials contain elm bark beetles trapped during a 24-hour period. The upper vial holds more than 5,000 bark beetles, attracted to virgin-female beetles constructing egg galleries in the elm bolts. The lower vial holds less than 500 beetles attracted to mated females constructing egg galleries in similar elm bolts.



Close-up of beetles being removed from the coated hardware cloth. Even though the beetles are considerably smaller than the 1/4 inch-space between the sticky wire strands, they are captured because the expanse of their inner membranous flight wings is also about 1/4 inch. When the insects are at rest, their flight wings are folded underneath the wing covers and are not visible in this photo.



Dr. A. Charles Lincoln, left and Dr. John W. Peacock, examine elm log for tunneling activity of adult beetles

Dr. John B. Simeone, left and Dr. Robert M. Silverstein, discuss field trap design.

In the study scientists found traps containing logs with mated beetles to be the next attractive, followed by logs with male beetles. Traps containing only elm logs were the least attractive of those tested.

From this study, scientists theorize that the female's attractant works in combination with the less attractive chemical that is produced in decaying elm tissue. This elm wood attractant, they feel, may be responsible for the initial attack by small numbers of male and female beetles on suitable breeding material; however, it is not until the tunneling virgin female beetles also produce their attractant that mass attack occurs.

Entomologists are now attempting to find out how virgin females produce the attractant. Working under grants from the Forest Service and the Elm Research Institute, chemists at Syracuse are beginning studies to determine the chemical nature of the attractant. After the attractant is isolated, the chemists will determine its molecular structure and then synthesize the material in large quantities. This research is expected to be completed in two years. Only then will the scientists be able to ascertain the practical value of the attractant in elm bark beetle control.

The sex attractant study is only one of several studies underway to develop safe, practical methods for Dutch elm disease control. Other Forest Service scientists are studying beetle parasites, beetle feeding stimulants and deterrents, chemosterilants, and safer insecticides. In addition, Agricultural Research Service scientists are studying systemic fungicides, and genetic resistance of elms to Dutch elm disease. Hopefully, these studies will provide several practical techniques that, in the future, will be used singly or in combination for a safe, integrated control program.